

fig. 1

Select T1.A, T2.B From T1, T2, T3
 Where T1.C=99 AND T2.D='george' AND T3.E=66
 AND T1.F=T2.F AND T2.G = T3.G;

$\Pi_{T1.A, T2.B}$

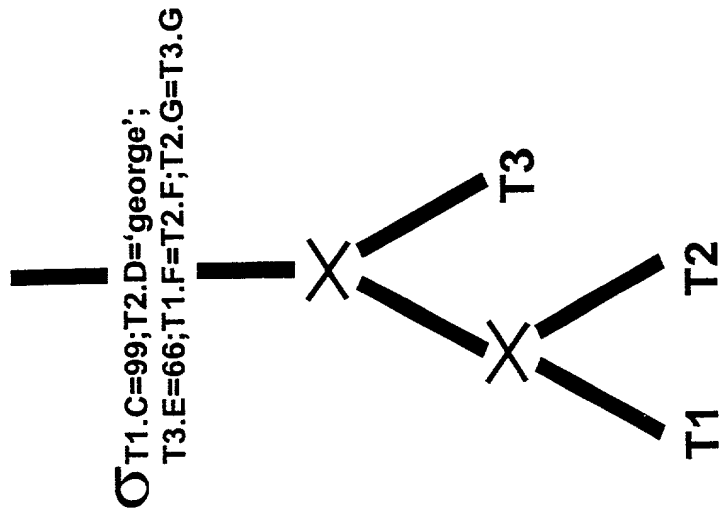


FIG. 2

Select T1.A, T2.B From T1, T2, T3
Where T1.C=99 AND T2.D='george' AND T3.E=66
AND T1.F=T2.F AND T2.G = T3.G;

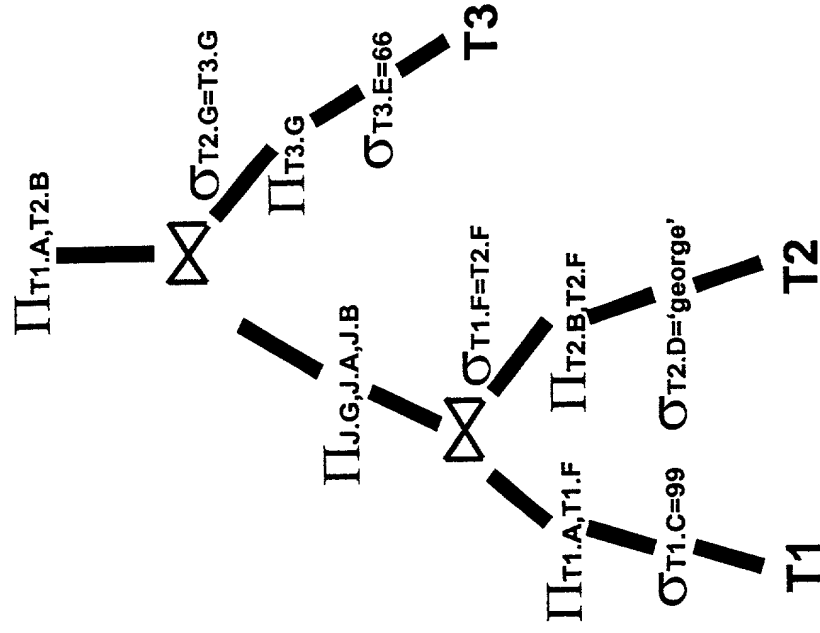
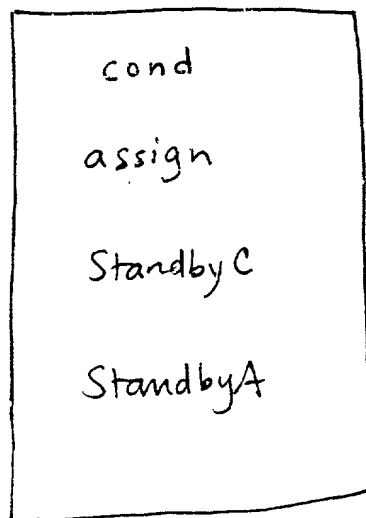


FIG. 3

Ti



σ_{cfi}

π_{cfsi}

FIG. 4

FIG. 5

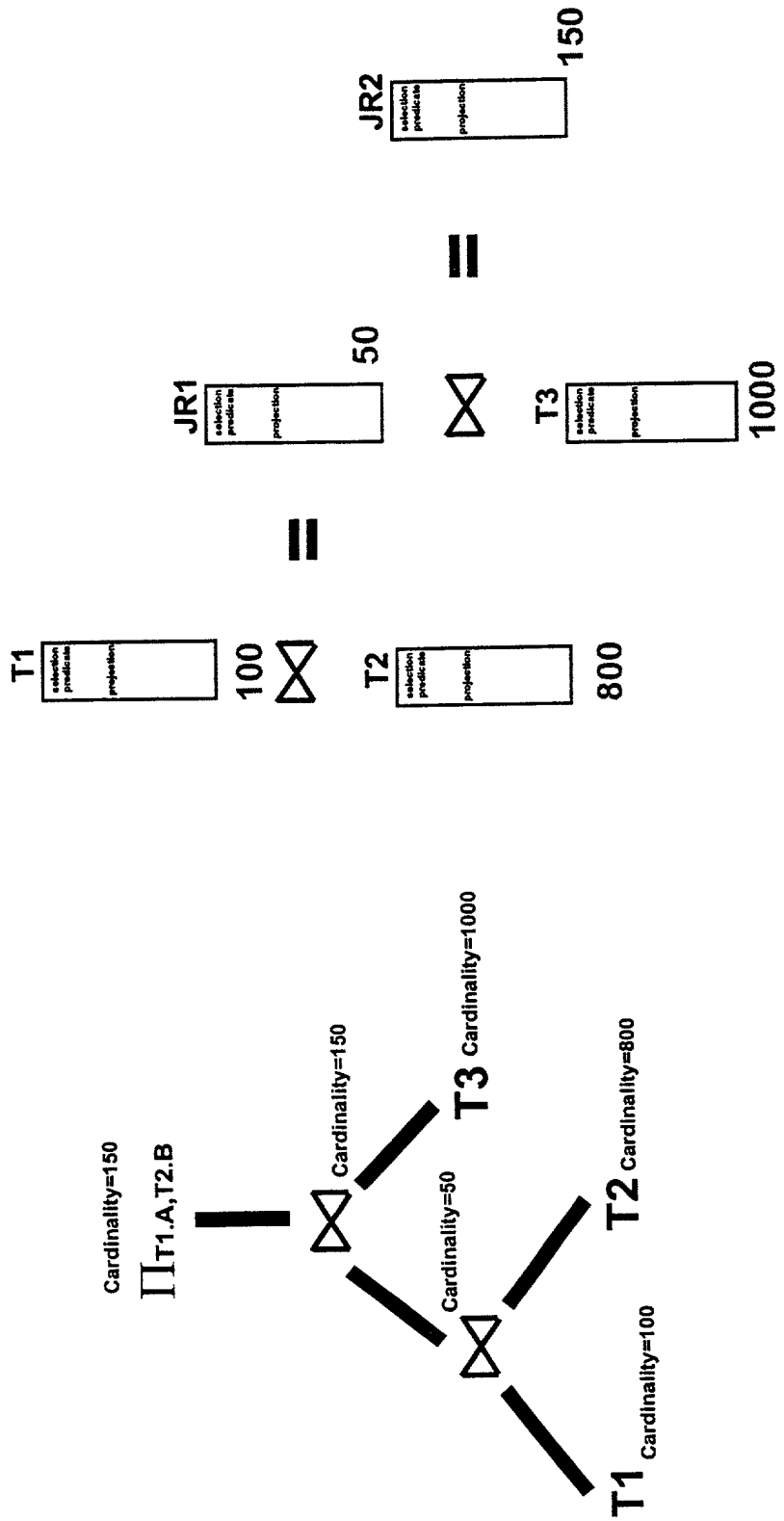
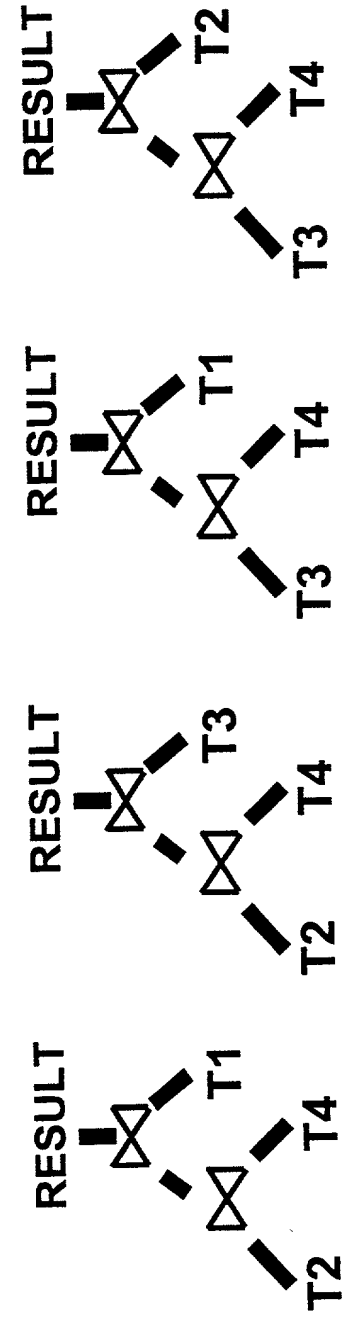
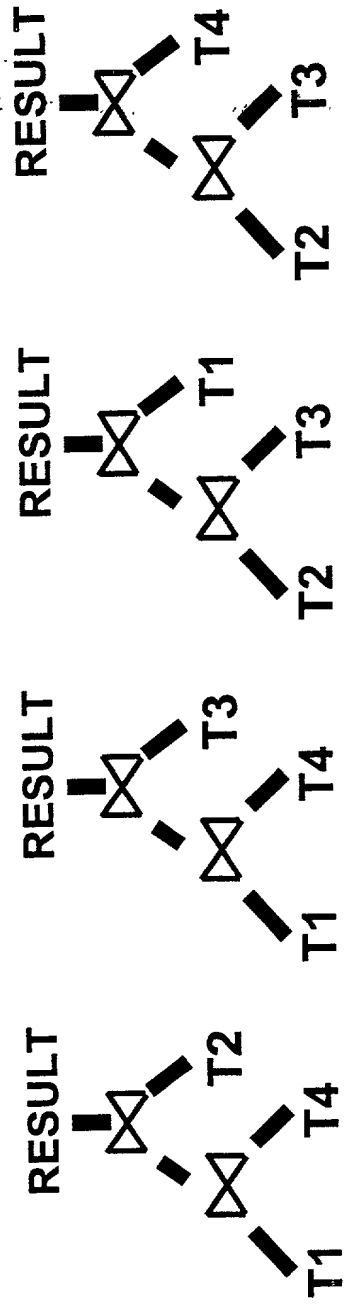
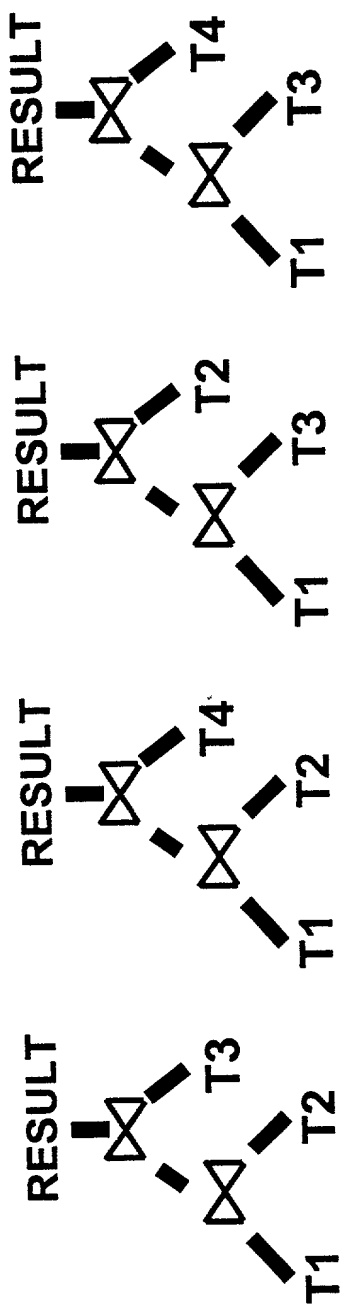


Fig. 6
Test sheet



Transform Predicate
Expression Into
Conjunctive Normal Form

102

Push Predicates
and Projections Down
Query Tree

104

Perform Per-Relation
Access Planning

106

Search For Applicable
DBS Indexes

108

Calculate Selectivity
And Cardinality

110

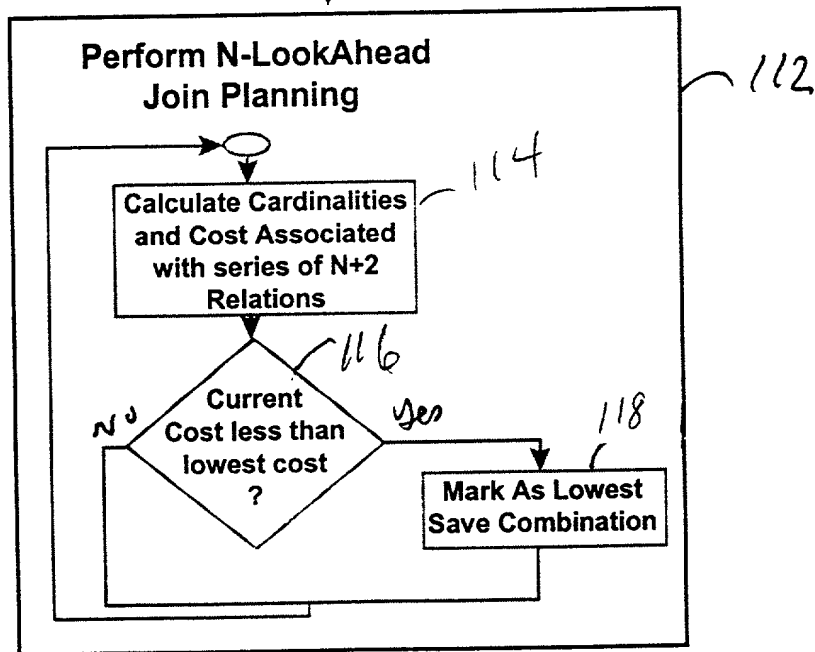


FIG. 7

Transform Predicate Expression Into Conjunctive Normal Form



Push Predicates and Projections Down Query Tree



```
graph TD; A[Perform Per-Relation Access Planning] --> B[Search For Applicable DBS Indexes]; B --> C[Place Costly Projection and Selection Predicate Operations On Stand-By Lists]; C --> D[Calculate Selectivity And Cardinality];
```

The flowchart illustrates the steps of the Per-Relation Access Planning process. It begins with a box labeled "Perform Per-Relation Access Planning", which leads to "Search For Applicable DBS Indexes". This step leads to "Place Costly Projection and Selection Predicate Operations On Stand-By Lists", which finally leads to "Calculate Selectivity And Cardinality". Handwritten annotations on the right side of the diagram include "206" next to the first box, "208" next to the second box, "210" next to the third box, and "212" next to the fourth box.

Search For Applicable DBS Indexes

Place Costly Projection and Selection Predicate Operations On Stand-By Lists

Calculate Selectivity And Cardinality



```

graph TD
    Start(( )) --> 216[Calculate Cardinalities and Cost Associated with series of N+2 Relations]
    216 --> 218[If Costly Selection and/or Projection Operations are involved, then perform Function Forwarding "tuning"]
    218 --> 220{Current Cost less than lowest cost ?}
    220 -- Yes --> 222[Mark As Lowest Save Combination]
    222 --> 216
    220 -- No --> End(( ))
  
```



Calculate Cardinalities and Cost Associated with series of N+2 Relations

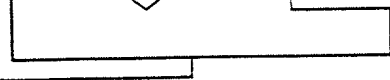
If Costly Selection and/or Projection Operations are involved, then perform Function Forwarding "tuning" — 218



Current Cost less than lowest cost ?



**Mark As Lowest
Save Combination**



F 16. 8

Select T1.A, T2.B, T3.Video.Colorize() From T1, T2, T3, T4
 Where T1.face = IMAGE(\url\myface.jpg) AND T2.D='george'
 AND T4.Audio = AUDIO(\url\georgeharrison.wav)
 AND T1.F=T2.F AND T2.G = T3.G AND T1.H = T4.H
 AND T2.K=T4.K;

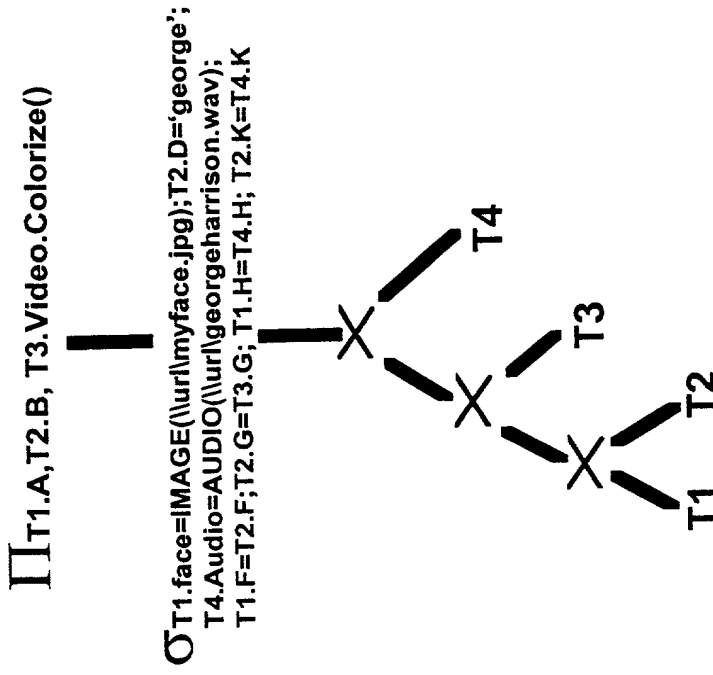
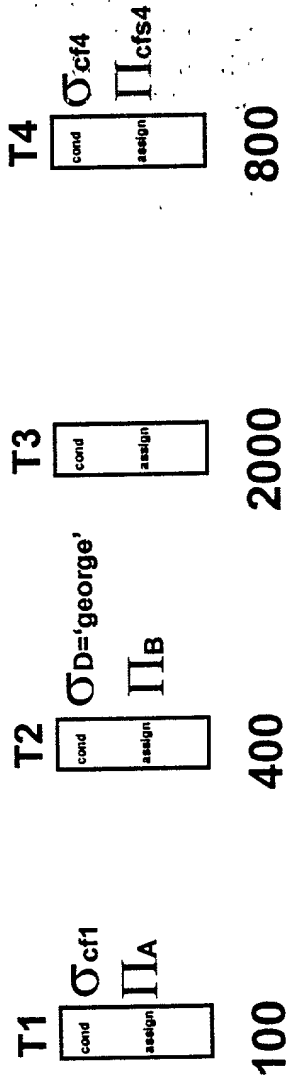


FIG. 9

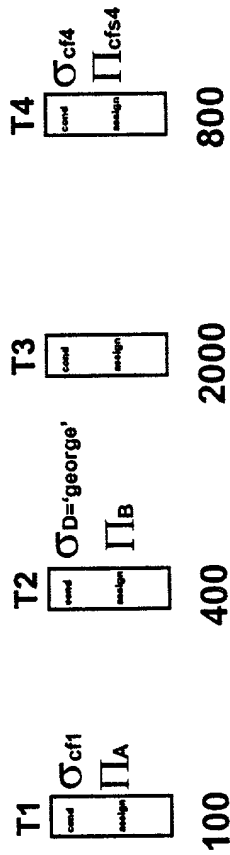
Select T1.A, T2.B, T4.Video.Colorize() From T1, T2, T3, T4
 Where T1.face = IMAGE(\\url\\myface.jpg) AND T2.D='george'
 AND T4.Audio = AUDIO(\\url\\georgeharrison.wav)
 AND T1.F=T2.F AND T2.G = T3.G AND T1.H = T4.H
 AND T2.K=T4.K;



T1.face = IMAGE(\\url\\myface.jpg)	σ_{cf1}
T4.Video.Colorize()	Π_{cfs4}
T4.Audio = AUDIO(\\url\\georgeharrison.wav)	σ_{cf4}

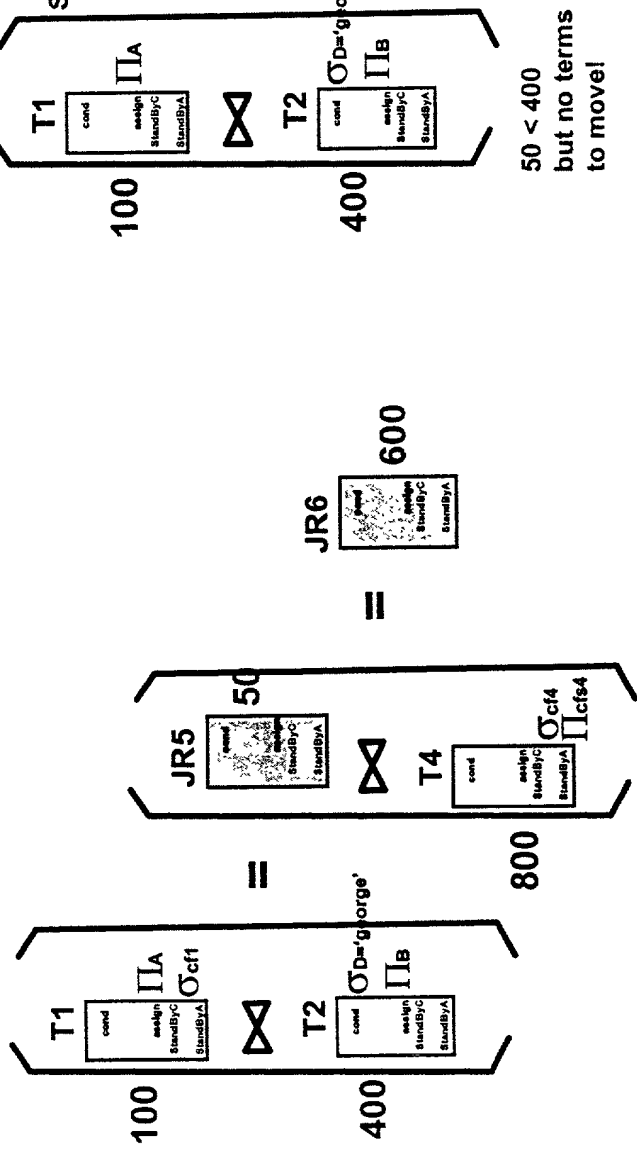
FIG. 10

KEY
 σ_{ctx} Predicate Selection
 Π_{ctx} Projection (Expression)
 \bowtie Join



$((1,2), 4)$

$((1,2), 4)$



STEP 2 : Calculate Access, Join Costs
 And All Cardinalities As Currently Done.
 (Ignoring Terms On StandBy)

STEP 3 : Examine Cardinalities For The
 "Triplet" and Move Costly Functions Toward
 Lowest Cardinality.

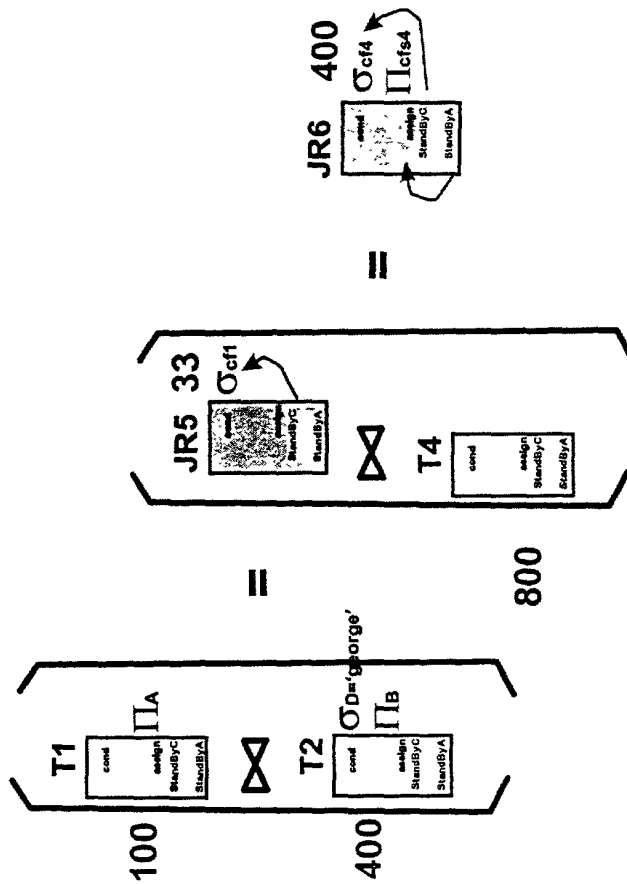
(Triplet Costing Within LookAhead Module)

T1	σ_{cf1} Π_A	100	T2	$\sigma_{D='george'}$ Π_B	400	T3	cond	2000	T4	σ_{cf4} Π_{cfs4}	800

KEY

σ_{cfk} Predicate Selection
 Π_{cfsx} Projection (Expression)
 \bowtie Join

((1,2), 4)



Repeat This Process
 For Every Triplet
 Containing Costly Funcs

FIG. 13

(Triplet Costing Within LookAhead Module)

**STEP 4 : Move Terms From StandBy Lists
 To Active Lists And Calculate New Join
 Cardinalities And "Tuned" Cost.**